

## **Tim Marker**

### **Development of a Laboratory Scale Burnthrough Test for Thermal Acoustic Insulation**

**Abstract.** This report summarizes the research and laboratory-scale tests undertaken by the Federal Aviation Administration (FAA) to develop a standardized test method for evaluating the postcrash fire burnthrough resistance of transport category aircraft thermal-acoustic insulation. Over sixty laboratory scale tests were conducted in various test rig configurations on a variety of insulation materials in an effort to establish a repeatable test condition that was representative of the threat likely to occur from a large external fuel fire. The finalized test apparatus utilizes an oil-fired burner adjusted to produce a flame temperature of 1900°F and accompanying heat flux of 16.0 Btu/ft<sup>2</sup>sec. The burner output cone was situated 4 inches from the plane of the specimen holder frame, at an angle of 30° with respect to horizontal. This configuration yielded results that correlated with previous full-scale tests using identical materials.

A number of fiberglass insulation modifications and new insulation materials were shown to be effective in varying degrees. A heat-treated, oxidized polyacrylonitrile fiber (OPF) encased in a polyimide bagging material prevented burnthrough for over 6 minutes, while a dot-printed ceramic paper in conjunction with 2 layers of fiberglass batting was capable of preventing burnthrough for over 8 minutes. Other technologies exist that are equally as effective. During the testing, it was also determined that the method of attaching the insulation blankets to the test specimen structure had a critical impact on the effectiveness of the insulation material. In addition, the insulation bagging material, normally a thermoplastic film, was not an important factor in delaying the burnthrough, although a polyimide film provided additional protection.

In order to better evaluate the repeatability of the test apparatus worldwide, a number of “round robin” test series were conducted. During the typical round robin, several different types of insulation blanket test samples were identically prepared and shipped to participating labs for testing. Test results were tabulated, compared, and analyzed to determine the degree of fluctuation or “scatter” of data from the labs. The standard deviation of test results from four round robins has shown that the data scatter has been reduced during each test series, indicating the test apparatus is repeatable.